

IN THE SUPREME COURT OF PENNSYLVANIA

NO. CAP 780

DAVID CHMIEL,

Petitioner,

v.

COMMONWEALTH OF PENNSYLVANIA,

Respondent.

**BRIEF OF *AMICUS CURIAE* IN
SUPPORT OF PETITIONER**

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INTEREST OF *AMICUS CURIAE*

The Innocence Project is an organization dedicated to providing pro bono legal and investigative services to prisoners for whom evidence discovered post-conviction can provide conclusive proof of innocence. The Innocence Project is also dedicated to improving the accuracy and reliability of the criminal justice system in future cases. Drawing on the lessons learned from cases in which the system convicted innocent persons, the Innocence Project advocates reforms designed to enhance the truth-seeking functions of the criminal justice system and thereby prevent future wrongful convictions. In this case, the Innocence Project seeks to present a broad legal and scientific perspective on hair microscopy comparison evidence in order to underscore the unreliability of such evidence and the undue weight that juries afford such evidence.

Amicus has a compelling interest in ensuring that criminal trials arrive at accurate determinations of guilt and promote justice. The advent of forensic DNA testing and the use of that testing to review criminal convictions have provided scientific proof that our system is susceptible to convicting the innocent. To date, 367 wrongfully convicted individuals have been exonerated through DNA testing. Faulty and misleading forensic evidence has contributed to 45% of wrongful convictions in the United States proven through DNA evidence, underscoring *Amicus's* interest in this matter. See *Overturing Wrongful Convictions Involving Misapplied Forensics*, INNOCENCE PROJECT (2019), <https://www.innocenceproject.org/overturing-wrongful-convictions-involving-flawed-forensics/>.

This *amicus* brief is necessary to address the following issue: the unfair prejudice caused by the introduction of flawed forensic evidence proffered as “scientific” evidence—here, hair microscopy—on the jury in a case in which evidence of guilt was otherwise entirely circumstantial.

SUMMARY OF ARGUMENT

David Chmiel was sentenced to death after a jury convicted him of the 1983 murders of Angelina, Victor, and James Lunario. Petitioner’s conviction rested, in large part, on the now debunked “science” of matching hair from a suspect to hair found at a crime scene based on physical similarities between the hairs when observed under a microscope—hair microscopy. Six hairs were recovered from a mask fashioned out of a sweater sleeve found at the crime scene. The sweater itself was traced to Petitioner’s brother Martin, who promptly accused Petitioner of committing the crime. At Petitioner’s trial, George Surma, a forensic practitioner, testified that hair found on the sweater mask was “microscopically similar” to Petitioner’s hair. Furthermore, Mr. Surma testified that he could exclude Martin as the source of the hair, even though Martin was the police’s first suspect in the case, and the person the defense pointed to as the perpetrator. Trial Transcript (“Tr.”), Aug. 27, 2002, at 21:2–11. For the reasons set forth below, such hair microscopy testimony is not scientifically valid and is inherently unreliable. It is therefore inadmissible as expert forensic evidence, irrespective of whether the testifying “expert” attempts to limit his or her testimony.

The introduction of flawed forensic evidence, such as the hair microscopy testimony admitted in Petitioner’s trial, has demonstrably led to wrongful convictions of innocent defendants. The National Academy of Sciences—a private, non-profit society of distinguished scholars established by Congress to advise the federal government on scientific and technical matters—undertook a study of forensic science in the United States and determined that many forensic techniques used in criminal trials have serious deficiencies, especially hair microscopy. *See* Nat’l Research Council of the Nat’l Acad. of Sciences, *Strengthening Forensic Science in the United States: A Path Forward* (2009) (“NAS Report”). Notwithstanding this, courts, attorneys,

and academics across the country have all recognized the unique power that expert forensic testimony, even flawed testimony, has on jurors. Indeed, such testimony can be powerful enough to convict the innocent. There are several reasons why forensic evidence is so persuasive: (1) jurors grant special deference to experts; (2) jurors assume that the scientific evidence has been reviewed by the court and determined to be trustworthy; and (3) jurors have inflated perceptions of the infallibility of forensic methodologies that claim to be grounded in science, such as hair microscopy. However, this trust is often misplaced. A 2009 study analyzing the trial transcripts of 137 exonerated individuals whose trials included forensic evidence—most commonly serological analysis and microscopic hair comparison—found that 60% involved invalid forensic testimony. See Brandon L. Garrett & Peter J. Neufeld, *Invalid Forensic Science Testimony and Wrongful Convictions*, 95 Va. L. Rev. 1, 1 (2009); see also *Overturing Wrongful Convictions Involving Misapplied Forensics*, *supra*. Introduction of invalid forensic evidence, such as hair microscopy, is particularly dangerous in light of the fact that jurors are less skeptical of, and more likely to be persuaded by, expert evidence. *Id.* at 9 (citing *United States v. Frazier*, 387 F.3d 1244, 1263 (11th Cir. 2004) (“[E]xpert testimony may be assigned talismanic significance in the eyes of lay jurors . . .”))

ARGUMENT

I. Hair Microscopy Evidence Is Not Scientifically Valid.

Hair microscopy—the only forensic evidence the state presented at Petitioner’s trial as indicative of his guilt—is unreliable, and absent accompanying and discriminating DNA evidence, does not meet the admissibility standard for forensic evidence in criminal trials.¹ In 2016, following a series of reports and articles that revealed the failings of hair microscopy

¹ There was DNA testing done before Petitioner’s 2002 trial, but it did not meaningfully identify or exclude any of the suspects.

evidence, the DOJ repudiated its own experts' testimony on microscopic hair comparison. *See* Letter from U.S. Dep't of Justice Fed. Bureau of Investigation, Office of the Director (Feb. 26, 2016). After the federal government admitted that hair microscopy testimony "did not meet accepted scientific standards," and that it overstated forensic matches of hair in favor of prosecutors in over 95 percent of trials, Dr. Victor W. Weedn, *Recent Developments in the Forensic Sciences*, FORENSIC SCIENCE AND FORENSIC EVIDENCE I, 65 U.S. Attorneys' Bulletin 1, 6–7 (Jan. 2017), courts around the country have granted defendants post-conviction relief because of the impact that this now-invalidated forensic testimony likely had on their convictions.

A. Hair Microscopy Evidence Does Not Meet The Standards Of Reliable Scientific Evidence.

Hair microscopy, which "is the examination and comparison of hairs under microscopes in an attempt to find a 'match'"² or, put otherwise, "one human being eyeballing one hair compared to another,"³ does not meet the standards for reliable forensic evidence.

In order for a scientific method to be valid and reliable, it must be subject to empirical testing. Such testing must reflect the conditions appropriate to the method's intended use, and provide valid estimates of how often examiners reach an incorrect conclusion, i.e., error rates. President's Council of Advisors on Sci. & Tech., *Report to the President: Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods* (Sept. 2016) ("PCAST Report"), at 46. For subjective feature-comparison methods, such as microscopic hair comparison, to be reliable, studies are required in which many examiners render decisions about various independent tests (typically involving "questioned" samples and one or more "known"

² Theodore Tibbitts, Post-Conviction Access to DNA Testing: Why Massachusetts's 278A Statute Should Be the Model for the Future, 36 B.C.J.L. & Soc. Just. 355, 356 n.11 (2016).

³ Christina Sterbenz, *Prosecutors Around the US are Relying on Shady Science—and It's a 'Mass Disaster,'* BUSINESS INSIDER (May 7, 2015), <https://www.businessinsider.com/its-terrifying-that-prosecutors-are-relying-on-hair-microscopy-2015-5>.

samples) and the error rates are determined. *Id.* This empirical testing is critical, because “[w]ithout appropriate estimates of accuracy, an examiner’s statement that two samples are similar—or even indistinguishable—is *scientifically meaningless . . .*” *Id.* (emphasis added). Hair microscopy does not comport with any of these requirements.

First, the threshold determination in hair microscopy—what qualifies as a purported “match” between two hairs—is unreliable because it is entirely subjective. Tibbitts, *supra* note 2. While there are certain features that are commonly considered as part of a hair microscopy analysis, such as color, length, and thickness, *see* NAS Report at 156, there is no consensus as to which features should be considered or the number of features as to which hairs must agree before an examiner may declare a “match.” M. Chris Fabricant & Tucker Carrington, *The Shifted Paradigm: Forensic Science’s Overdue Evolution from Magic to Law*, 4 Va. J. Crim. L. 1, 90 (2016). In fact, hair from the same person can vary greatly, whereas hair from two unrelated individuals may be very similar, rendering hair microscopy evidence vulnerable to high error rates and uneven application. Jessica D. Gable & Margaret D. Wilkinson, “*Good*” *Science Gone Bad: How the Criminal Justice System Can Redress the Impact of Flawed Forensics*, 59 Hastings L.J. 1001, 1007 (2008). As a result, simply making an association between a questioned hair and a known hair, e.g., declaring the two hairs microscopically similar, has led to wrongful convictions. In the case of *State v. Reid*, for example, the lead criminologist at the Connecticut Forensic Science Laboratory testified that pubic hairs found on the victim’s clothing were “microscopically similar” to pubic hair samples taken from Mark Reid, the defendant, who is African American. 757 A.2d 482 (Conn. 2000); *see also* Fabricant & Carrington, *supra*, at 83. Subsequent DNA testing not only excluded Reid as the source, but established that the pubic hairs originated from the Caucasian victim. Fabricant & Carrington, *supra*, at 83. In *Tribble v. United*

States, mitochondrial DNA testing revealed that two FBI-trained analysts could not even distinguish human hairs from canine hairs using microscopic hair comparison. *Id.* at 91; *see also Innocence Project Cases: Santae Tribble*, INNOCENCE PROJECT (last visited Dec. 2, 2019), <https://www.innocenceproject.org/cases/santae-tribble/>. In yet another case, Ron Williamson and Dennis Fritz were wrongfully convicted of murdering a young woman after hair analysts examined seventeen hairs and “matched” them to Williamson and Fritz. Barry Scheck et al., ACTUAL INNOCENCE 213–14 (2000). Years later, DNA testing revealed that not a single one of the seventeen hairs originated with either defendant; the error rate was a perfect 100 percent. In fact, DNA testing also revealed that two hairs found around the victim’s body belonged to Glen Gore, the prosecution witness who implicated Williamson, and who state examiners had “excluded” as a possible source of the hairs. *Id.* (“Fifteen years earlier, the state hair examiners...excluded [Gore] as the source of what appears to be his own hair.”).

Second, even if the features required for a “match” were agreed upon—which they are not—there is no consensus on the distribution of hair characteristics among the population. Gable & Wilkinson, *supra*, at 1007 (“Hair microscopy is not accompanied by empirical data that exhibits any population frequencies of hair consistencies.”); *see also* NAS Report at 160 (“No scientifically accepted statistics exist about the frequency with which particular characteristics of hair are distributed in the population.”). Therefore, the conclusion of a “match” or a finding that hairs are “microscopically similar” means only that the hair *could have* come from *any* person whose hair exhibited similar microscopic characteristics; it cannot uniquely identify one person nor can it identify the size of the potential pool of people whose hair exhibits the same microscopic characteristics. NAS Report at 156.

Third, hair microscopy is not used in any scientific context outside of criminal investigations, and therefore the incentive to do peer review studies has been lacking. Moreover, the ability to do such studies is constrained by the lack of information regarding distribution of hair characteristics in the population. *See* Gable & Wilkinson, *supra*, at 1007 (“Throughout its history, microscopic hair comparison has been a forensic technique that has little relevance outside of a criminal investigation. As a result, it . . . receives little attention from the scientific world at large” and such “limited exposure to anything resembling peer review, proficiency testing, and error ratings would be enough to render the technique unreliable in most scientific fields.”). Absent such testing and peer review, there is nothing to support the purported validity of hair microscopy.

Furthermore, the “entirely subjective,” *see* Tibbitts, *supra* note 2, and unscientific nature of hair microscopy evidence renders it susceptible to cognitive bias.⁴ Paul C. Giannelli, *Microscopic Hair Comparisons: A Cautionary Tale*, 46 No. 3 *Crim. L. Bull. Art. 7* (April 2010), at 4. Cognitive bias arises where subjective interpretations are required, because people tend to see what they expect to see. *Id.*; *see also* Giannelli, *Cognitive Bias in Forensic Science*, *supra* note 4; Itiel E. Dror et al., *Contextual Information Renders Experts Vulnerable to Making Erroneous Identifications*, 156 *Forensic Sci. Int’l* 74 (2006); D. Michael Risinger et al., *The Daubert/Kumho Implications of Observer Effects in Forensic Science: Hidden Problems of Expectation and Suggestion*, 90 *Cal. L. Rev.* 1 (2002). In criminal investigations, cognitive bias frequently plays a role because “the police generally have little or no doubt regarding the suspect’s guilt[,]” and their

⁴ Cognitive bias can take many forms including “contextual bias,” which occurs when extraneous information influences a decision, typically in cases of ambiguity; “confirmation bias,” which concerns the tendency to test a hypothesis by looking for instances that confirm it rather than by searching for potentially falsifying instances; and “motivational” or “role effects” bias, where people’s perception of their role can influence their decisions, especially in cases of ambiguity. Paul C. Giannelli, *Cognitive Bias in Forensic Science*, 25 *Crim. Just.* 61, 61–62 (2010).

focus “lies with obtaining sufficient proof for a conviction[.]” Larry S. Miller, *Procedural Bias in Forensic Science Examinations of Human Hair*, 11 Law & Hum. Behav. 157, 158 (1987) (citation omitted).

In hair comparison, the examiner is typically “given hair samples *from a known suspect*” along with a report “including other facts and information relating to the guilt of the suspect” before being asked whether two hairs are a match. Giannelli, *Microscopic Hair Comparisons: A Cautionary Tale*, *supra*, at 4, n.18 (emphasis added). A study on cognitive bias in forensic science involving hair analysis affirmed that due to the subjective nature of hair-microscopy, it is susceptible to cognitive bias: “[a] preconceived conclusion that a questioned hair sample and a known hair sample originated from the same individual may influence the examiner’s opinion...” Miller, *supra*, at 161. In overturning the wrongful conviction of George Perrot in Massachusetts, the influence of confirmation bias on a hair examiner’s conclusion “matching” Perrot’s hair to a crime scene hair was specifically addressed by the court. Because the hair expert was provided with prejudicial, irrelevant case information, the court found that, “[u]nconsciously, [the expert], because of these communications, departed from his role as a neutral expert and slipped into the role of a partisan for the government.” *Commonwealth v. Perrot*, No. 85-5415, 2016 WL 380123, at *30 (Mass. Super. Ct. Jan. 26, 2016).

Despite these known limitations, in Petitioner’s case, Mr. Surma testified that two of the six hairs found on the sweater mask were “microscopically similar” to Petitioner’s hair, and that he could exclude Martin Chmiel as the source of the hairs. Prior to Petitioner’s 2002 trial, these two hairs were sent for mitochondrial DNA testing. The DNA testing resulted in a profile from which Petitioner, Martin, any of their maternal relatives, and an *unknown number of other people* could not be excluded. Trial Tr., Aug. 29, 2002, at 172–175. It strains credulity that Mr.

Surma’s evaluation of the hairs under a microscope had more specific results than mitochondrial DNA testing. That Mr. Surma claimed to be able to do through hair microscopy what even mitochondrial DNA testing could not do—exclude Martin Chmiel as the source of the hairs—demonstrates the lack of any scientific basis for his testimony.

Ultimately, hair microscopy yields “nothing more than an educated guess,” which “cannot... be admitted as evidence under the guise of expert opinion.” Bruce A. MacFarlane, *Wrongful Convictions: Is it Proper for the Crown to Root Around, Looking for Miscarriages of Justice?*, 36 Man. L.J. 1, 6 n.12 (2012). The NAS report explained that microscopic hair analysis must be confirmed using mitochondrial DNA analysis, which in Petitioner’s case was inconclusive, and that microscopic studies alone are of limited probative value. NAS Report at 161. The committee concluded that any effort to link a specific defendant to hair evidence on the basis of microscopy alone has “*no scientific support.*” *Id.* (emphasis added).

B. The Department Of Justice And Courts Have Repudiated Hair Microscopy Evidence.

After the exoneration of three defendants between 2009 and 2012 who were convicted on microscopic hair comparison evidence which turned out to be wrong, the DOJ and FBI conducted an internal review of every case in which FBI Special Agents proffered microscopic hair analysis cases to determine the extent to which hair microscopy evidence may have tainted convictions. See NACDL, *Microscopic Hair Comparison Review Project* (2018), <https://www.nacdl.org/haircomparison/>; Spencer S. Hsu, *Justice Dept., FBI to Review Use of Forensic Evidence in Thousands of Cases*, WASHINGTON POST (July 10, 2012), https://www.washingtonpost.com/local/crime/justice-dept-fbi-to-review-use-of-forensic-evidence-in-thousands-of-cases/2012/07/10/gJQAT6DlbW_story.html. That review led the DOJ to publicly acknowledge that microscopic hair analysis was severely limited and could not support

any kind of probabilistic assessment about the source of a specific hair of unknown origin. *See* U.S. Dep’t of Justice Fed. Bureau of Investigation, *Microscopic Hair Comparison Analysis*, at 1 (Nov. 9, 2012). In reviewing convictions based on hair microscopy evidence, the government has gone so far as to concede that testimony presented by hair microscopy analysts constitutes “false evidence.” *See Jones v. United States*, No. 15-CO-1104 (D.C. Cir. 2019); *United States v. Ausby*, No. 17-3077 (D.C. Cir. 2019).

Following the DOJ’s admission that microscopic hair comparison evidence is unreliable, courts around the country have also found the technique to be unreliable and unfairly prejudicial, and have granted post-conviction relief for cases involving this type of discredited evidence. *See, e.g., State v. Bridges*, No. 90 CRS 23102-04, 2015 WL 12670468, at *2 (N.C. Super. Ct. Oct. 1, 2015) (granting post-conviction relief after finding that the admission of erroneous hair microscopy testimony violated due process rights); *Perrot*, 2016 WL 380123, at *42 (granting post-conviction relief after finding that the admission of now-discredited hair evidence constitutes newly available evidence); *Pitts v. State*, 2016 Ark. 345, 501 S.W.3d. 803 (granting post-conviction relief where state’s expert may have withheld evidence regarding the integrity of hair comparison analysis); *Martin v. State*, 2018 Ark. 344, at 7–8 (finding sufficient grounds to reinvest jurisdiction in the circuit court to consider Mr. Martin’s petition for post-conviction relief where the hair comparison analysis provided the “only substantial evidence” implicating Mr. Martin in the crime); *Tribble v. District of Columbia*, No. 2013 CA 003237 B, 2016 WL 927078, at *5 (D.C. Super. Ct. Feb. 26, 2016) (awarding Mr. Tribble \$13.2 million in damages after he was falsely convicted based on hair microscopy evidence). As these decisions make clear, hair microscopy evidence is not reliable or scientifically valid, and convictions tainted by such evidence should be viewed with great skepticism.

II. Flawed Scientific Evidence Plays A Critical Role In Wrongful Convictions.

Forensic evidence plays a prominent role in the United States criminal justice system. Not only is its use widespread, it has a uniquely persuasive impact on juries. Accordingly, where misleading, mistaken, or unreliable forensic evidence, such as hair microscopy, is admitted at a criminal trial, there is a serious risk that juries will overvalue this evidence and convict innocent people of crimes they did not commit.

A. Forensic Evidence Has Significant Persuasive Power Over Juries.

There are several reasons why jurors are highly persuaded by expert forensic testimony, even when it is flawed. *First*, jurors grant special deference to experts because they have difficulty interpreting and evaluating forensic evidence and instead rely on the expert's background and experience to validate their testimony. *Second*, jurors believe that the court has reviewed the scientific evidence before admission and determined it to be trustworthy. *Finally*, jurors have false perceptions of rates of error of scientific methodologies, such as hair microscopy. *See, e.g., Frazier*, 387 F.3d at 1263; *State v. Krause*, No. 2 CA-CR 2015-0326-PR, 2015 WL 7301820, at *5 (Ariz. Ct. App. Nov. 19, 2015) (“[C]ourts have recognized that jurors may give significant weight to scientific evidence.”); *R. v. Mohan*, [1994] 2 S.C.R. 9, 21 (Can.) (“[d]ressed up in scientific language which the jury does not easily understand and submitted through a witness of impressive antecedents, this evidence is apt to be accepted by the jury as being virtually infallible and as having more weight than it deserves.”). The more than seventy wrongful convictions attributable, at least in part, to the introduction of hair microscopy evidence amply demonstrate the profound effect scientifically questionable forensic evidence can have on juries. *See, Fabricant & Carrington, supra*, at 80. The numerous cases overturning wrongful convictions that were premised in part on hair microscopy evidence demonstrate that jurors are prone to afford weight to such evidence, even when the evidence is inaccurate. In many of those cases, the hair

microscopy evidence was later demonstrably proven to be wrong or generally discredited. Granting post-conviction relief in these indicates the court's understanding that the jurors must have placed weight on the discredited evidence such that its admission was not harmless error. *See e.g., Strawhacker v. State*, 2016 Ark. 348, at 7–8, 500 S.W.3d 716, 720 (reinvesting the circuit court with jurisdiction because it found a “reasonable probability” that the result would have been different had it been known that the hair comparison testimony was erroneous).

1. Jurors Place Undue Weight On Experts' Background And Experience To Evaluate Their Testimony.

Lay jurors are unlikely to fully understand the scientific principles behind forensic evidence, leading them to grant special deference to the expert's testimony. *See* Geoffrey M. Pipoly, *Daubert Rises: The (Re)applicability of the Daubert Factors to the Scope of Forensics Testimony*, 96 Minn. L. Rev. 1581, 1601–02 (2012) (“The scope of an expert witness's testimony is significant, principally because jurors tend to defer to experts . . .”). Scholars have observed that at trial many juries tend to uncritically accept the testimony of forensic experts even when they should not. *See, e.g.,* Kit R. Roane & Dan Morrison, *The CSI Effect*, 138 U.S. News & World Report 15, 2005 WLNR 25563240, at *3 (Apr. 25, 2005); Kimberlianne Podlas, “*The CSI Effect*”: *Exposing the Media Myth*, 16 Fordham Intell. Prop. Media & Ent. L.J. 429, 437–38 (2005); Mark A. Godsey & Marie Alou, *She Blinded Me With Science: Wrongful Convictions and the “Reverse CSI-Effect,”* 17 Tex. Wesleyan L. Rev. 481, 483–84 (2011). Indeed, interviews of jurors have revealed that, in cases where the physical evidence seemed contradictory and inconsistent, some jurors have based guilty verdicts on their beliefs that “CSI-types know what they're doing—they can solve anything . . .” *See id.* at 496–97 (internal quotation marks omitted).

Because of the difficulty in evaluating scientific evidence, jurors use certain cues, beyond the substance of the testimony, to determine its validity. For example, jurors rely on

experts' background and experience, as presented at trial, to determine the meaning and value of the scientific evidence, rather than the evidence itself. Jonathan J. Koehler et al., *Science, Technology, or the Expert Witness: What Influences Jurors' Judgments About Forensic Science Testimony?*, 22 *Psychol., Pub. Pol'y, & L.* 401, 410 (2016); *see also* David L. Faigman et al., *Modern Scientific Evidence: The Law & Science of Expert Testimony* (1997) (when an expert "bases [an] opinion on 'years of experience' the practical result is that the witness is immunized against effective cross examination"). However, "these cues are problematic because it is not clear that a more impressive sounding background or more case experience provide a valid indicator of greater expertise or accuracy." Koehler et al., *Science, Technology, or the Expert Witness, supra*, at 410. In fact, in several forensic science fields, literature indicates that there is little or no relationship between an expert's experience and his or her accuracy in identification. *Id.* And what is in fact an essential factor for scientists in determining a method's trustworthiness—whether it has been scientifically tested—does not seem to affect jurors' evaluation of the probative value of the evidence. *Id.* at 411.

In Petitioner's case, Mr. Surma testified that he received "extensive training" in the field of forensic science, that he worked for the Pennsylvania State Police as a forensic scientist for 27 years, and that he had been qualified to testify as a hair microscopy expert *300–400 different times*. Trial Tr., Aug. 27, 2002, at 4–6. It was after this testimony that Mr. Surma said with certainty that, of the two potential suspects of the crime, Petitioner and his brother Martin, the hair found at the crime scene definitively *did not* match Martin but *could* still match Petitioner. Mr. Surma's testimony about his experience is the kind of testimony likely to cause jurors to afford undue weight to the "expert's" testimony and to overestimate the probative value of Mr. Surma's conclusion.

2. Jurors Give Expert Testimony Additional, Unwarranted Weight Because It Has Passed Through A Judicial Filter.

An unintended consequence of the courts' gatekeeping role⁵ is that when judges admit expert testimony, it acquires additional persuasive impact because it has passed through a judicial filter. See N.J. Schweitzer & Michael J. Saks, *The Gatekeeper Effect: The Impact of Judges' Admissibility Decisions on the Persuasiveness of Expert Testimony*, 15 Psychol., Pub. Pol'y, & L. 1, 2 (2009). This phenomenon has been termed the "gatekeeper effect." *Id.* at 4. As discussed, lay fact finders are typically ill-equipped to critically evaluate scientific evidence and instead rely on institutional cues of validity, including the simple fact that such testimony was admitted by a judge. *Id.* Indeed, research shows that the primary predictor of jurors' views on the persuasiveness and quality of evidence is whether or not it was admitted into evidence; neither the absence of any rigorous scientific foundation for the evidence nor the credibility of the source affected the persuasiveness of the evidence. *Id.* at 8.

"[J]urors assume too much about the quality of scientific evidence presented at trials. Specifically, jurors assume that judges review scientific evidence before it is presented to them, and that any evidence used in a trial must be above some threshold of quality." *Id.* at 12. Jurors' apparent reliance on judges to filter expert evidence is misplaced, given that several jurisdictions, including Pennsylvania, do not adhere to the *Daubert* standards for expert admissibility. See *id.* Pennsylvania adheres to a modified *Frye* standard, which merely requires that an expert's methodology have "general acceptance" in the relevant scientific community. *Commonwealth v. Walker*, 92 A.3d 766, 789 (Pa. 2014) (citations omitted). Even within

⁵ The court has a gatekeeping role to prevent flawed forensic evidence from being admitted into evidence. See *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579 (1993); see also Michael H. Graham, *The Expert Witness Predicament: Determining "Reliable" Under the Gatekeeping Test of Daubert, Kumho, and Proposed Amended Rule 702 of the Federal Rules of Evidence*, 54 U. Miami L. Rev. 317, 317 (2000) ("[T]he trial court has a gatekeeping obligation to determine whether . . . expert witness's testimony is 'reliable,' regardless of whether it is based on scientific, technical or other specialized knowledge.").

jurisdictions that follow *Daubert*, there is reason to believe that judges may not appropriately screen expert evidence, particularly in criminal cases. *Id.*; see also Brandon L. Garrett & M. Chris Fabricant, *The Myth of the Reliability Test*, 86 Fordham L. Rev. 1559, 1563–64 (2018) (finding that courts in criminal cases almost never apply the reliability prongs of their states’ equivalents of Fed. R. Evid. 702). In some cases, like Petitioner’s, judges do not screen expert evidence at all because the defendant’s attorney does not raise a challenge to the validity or admissibility of the evidence.

3. Jurors Have A False Perception Of Error Rates In Scientific Methodologies And Therefore Overestimate The Reliability Of Expert Forensic Testimony.

Research shows that introducing evidence through experts causes jurors to uncritically accept the testimony, even when the limitations of the evidence are exposed.

Jurors believe that the risk of a false positive error with forensic evidence is extremely low, thus further inflating their inaccurate perceptions of its reliability. A study revealed that jurors’ perceived error rate for hair microscopy—meaning the perceived likelihood an examiner would conclude that two hairs shared a common source when they did not—was 1 in 1,000,000, Jonathan J. Koehler, *Intuitive Error Rate Estimates for the Forensic Sciences*, 57 *Jurimetrics J.* 153, 163 (2017), when in fact the reality is closer to 1 in 10, Max M. Houck & Bruce Budowle, *Correlation of Microscopic and Mitochondrial DNA Hair Comparisons*, 47 *J. Forensic Sci.* 964 (2002). However, “we know little about the rate at which forensic methods err,” and “reliable data on false positive error rates do not exist” for most forensic methods. Koehler, *Intuitive Error Rate Estimates for the Forensic Sciences*, *supra*, at 164, 165; see also PCAST Report at 45 (“[A]ll indications point to the actual error rates being orders of magnitude higher” than what jurors estimate.). “With the exception of nuclear DNA analysis . . . *no forensic method has been rigorously shown to have the capacity to consistently, and with a high degree of certainty,*

demonstrate a connection between evidence and a specific individual or source.” NAS Report at 7 (emphasis added). Nevertheless, jurors assume that forensic evidence is reliable and are willing to convict based on little else. *See, e.g., Hinton v. Alabama*, 571 U.S. 263, 276 (2014). “[P]eople generally think that the risk of false positive error for DNA, fingerprints, bite marks, *microscopic hair*, and handwriting is *one in a million or less.*” Koehler, *Intuitive Error Rate Estimates*, *supra*, at 165 (emphasis added).

This is particularly true in pattern-matching techniques, such as microscopic hair comparison, because “jurors have no way to know how often two different samples would share features,” PCAST Report at 54 n.123, and they “are likely to overestimate the probative value of a ‘match’ between samples.” *Id.* at 45; *see also United States v. Glynn*, 578 F. Supp. 2d 567, 574 (S.D.N.Y. 2008) (“[C]ross-examination is inherently handicapped by the jury’s own lack of background knowledge, so that the Court must play a greater role, not only in excluding unreliable testimony, but also in alerting the jury to the limitations of what is presented.”).

Courts too have cautioned that “scientific evidence presented as proof ‘can assume the posture of mystic infallibility in the eyes of the jury.’” *Podlas*, *supra*, at 437 (citation omitted); *see, e.g., Frazier*, 387 F.3d at 1263 (“[E]xpert testimony may be assigned talismanic significance in the eyes of lay jurors, and, therefore, the district courts must take care to weigh the value of such evidence against its potential to mislead or confuse.”); *United States v. Hines*, 55 F. Supp. 2d 62, 64 (D. Mass. 1999) (“[A] certain patina attaches to an expert’s testimony unlike any other witness; this is ‘science,’ a professional’s judgment, the jury may think, and give more credence to the testimony than it may deserve.”). The DOJ has acknowledged that “[j]udges and juries put great stock in this type of forensic testimony, and when presented at trial, such evidence can make the

difference between conviction and acquittal.” Sally Q. Yates, *Introduction, in FORENSIC SCIENCE AND FORENSIC EVIDENCE I*, 65 U.S. Attorneys’ Bulletin 1, 1 (Jan. 2017).

B. Introduction Of Flawed Forensic Evidence Leads To Wrongful Convictions.

In 2005, Congress authorized the National Academy of Sciences to create a committee to study forensic science. NAS Report at 1. Congress instructed the committee to, among other things, identify potential scientific advances to assist law enforcement, and disseminate best practices and guidelines for forensic evidence. *Id.* at 1–2. Over two years, the committee heard expert testimony from government officials, research scholars, scientists, medical examiners, crime laboratory officials, and other relevant specialists. *Id.* at 2.

Based on this comprehensive study, the committee issued a report critical of many forensic techniques, especially hair microscopy. Although certain forensic disciplines, such as latent fingerprint analysis, responded by engaging in validation research and proficiency testing, leading to subsequent approval, *see* PCAST Report at 9 (finding that latent fingerprint analysis is “foundationally valid”), hair microscopy remains an unreliable method that produces a high proportion of false associations. *Id.* at 120, 139–40.

The Supreme Court has recognized that forensic techniques can be unreliable and the introduction of misleading testimony based on these techniques dangerous to the fair administration of justice. *See, e.g., Hinton*, 571 U.S. 263. The Court noted the “threat to fair criminal trials posed by the potential for incompetent or fraudulent prosecution forensics experts . . .” *Id.* at 276. It pointed out the “serious deficiencies [that] have been found in the forensic evidence used in criminal trials,” citing a 2009 study finding that invalid forensic testimony had contributed to the convictions in 60% of cases overturned by exonerating evidence. *Id.* (quoting *Melendez-Diaz v. Massachusetts*, 557 U.S. 305, 319 (2009)). Other courts have noted that expert

forensic testimony can be flawed and unreliable. *See, e.g., United States v. Bentham*, 414 F. Supp. 2d 472, 473 (S.D.N.Y. 2006) (“False positives—that is, inaccurate incriminating test results—are endemic to much of what passes for ‘forensic science’ . . . Even the ‘gold standard’ of forensic testing, DNA tests, may . . . prove fallible.” (internal citations omitted)); *House v. Bell*, 386 F.3d 668, 709 (6th Cir. 2004), *rev’d and remanded*, 547 U.S. 518 (2006) (“High on the list of the causes for mistakes are the kinds of errors we see in this case: the misinterpretation or abuse of scientific evidence . . .”).

The power and potentially misleading nature of purported expert forensic evidence is of course compounded when the science is flawed. While “reliable data on false positive error rates do not exist . . . it seems safe to suggest that jurors’ error rate estimates are too low” and “courts should take seriously the possibility that jurors will overweigh various types of forensic science evidence because they mistakenly believe that the risk of error is infinitesimal.” Koehler, *Intuitive Error Rate Estimates*, *supra*, at 165-166. NAS concluded juries will give “undue weight to evidence and testimony derived from imperfect testing and analysis.” NAS Report at 4.

Even when a purported expert’s testimony is carefully nuanced or limited, for the reasons set forth above, it is unlikely that jurors will understand the extremely limited—if any—probative value of the microscopic observations, rendering such testimony inherently misleading and unfairly prejudicial, especially in light of the likely influence of confirmation bias discussed *supra*. In *State v. Reid*, discussed *supra*, the microscopy expert testified that “although microscopic hair analysis cannot identify positively the exact individual from whom the hair originated, it is useful for the purpose of determining whether a person is one of the class of people from whom the hair in question could have originated.” 757 at 489. He further explained that “microscopic hair analysis alone is not sufficient . . . to identify an individual” and that he could not

say “that the hairs in question were definitely the hairs of the defendant.” *Id.* Based partially on the hair comparison testimony, the jury convicted Mr. Reid. Years later, Mr. Reid was exonerated after DNA testing excluded him as the source of the hair. Fabricant & Carrington, *supra*, at 82; *see also* North Carolina Innocence Inquiry Comm’n Brief for State v. Joseph Sledge, *North Carolina v. Sledge*, 78-CRS-2415 & 16 (Super. Ct. Columbus Cty.), at p. 177 (citing Second Trial Transcript, *North Carolina v. Sledge*, 78-CRS-2415 & 16 (Super. Ct. Columbus Cty.), August 21, 1978 Super. Ct. Session Columbus Cty.) (the hair analyst testified that hairs found on the victim “could” have originated from the defendant, and the jury nevertheless wrongfully convicted Mr. Sledge, who spent 36 years in prison for a murder he did not commit). Clearly, attempts to limit the significance of hair-microscopy evidence do not protect against wrongful convictions.

There is inherent danger to the judicial process when unsound forensic testimony is presented to a jury. Given the persuasive power that expert testimony can have on jurors, and jurors’ often unfounded beliefs about the reliability of forensic methods, the admission of flawed forensic evidence can lead juries to convict defendants when sound evidence is sorely lacking.

III. The Hair Evidence Admitted In Petitioner’s Case Suffers From The Very Flaws Condemned By The Scientific Community And Federal Government And Is Unworthy Of Confidence.

Due process requires that a conviction be set aside where there is any reasonable likelihood that false or misleading evidence could have affected the judgment of the jury. *United States v. Agurs*, 427 U.S. 97, 103 (1976); *Napue v. Illinois*, 360 U.S. 264, 272 (1959) (reversing conviction where false testimony used by the state “may have had an effect on the outcome of the trial”); *see also Jones v. United States*, No. 15-CO-1104 (D.C. Cir. 2019); *United States v. Ausby*, No. 17-3077 (D.C. Cir. 2019). As the Third Circuit held, the admission of fundamentally unreliable expert scientific testimony entitles a defendant to relief. *See Lee v. Glunt*, 667 F.3d 397 (3d Cir. 2012).

Petitioner's due process rights were violated when the Commonwealth introduced false and misleading scientific evidence which rendered the trial fundamentally unfair. When there are issues of "fundamental fairness," our criminal justice system requires that the conviction be vacated. *Strickland v. Washington*, 466 U.S. 668, 670, 696 (1984) ("[T]he ultimate focus of inquiry must be on the fundamental fairness of the proceeding whose result is being challenged... In every case the court should be concerned with whether, despite the strong presumption of reliability, the result of the particular proceeding is unreliable because of a breakdown in the adversarial process that our system counts on to produce just results.").

The hair microscopy evidence introduced in Petitioner's trial was false and misleading, and unreliable at its core. Mr. Surma's trial testimony was of the sort that the federal government and courts have found to be unreliable, and was also material to Petitioner's conviction. Mr. Surma testified not only that hair found at the crime scene was "microscopically similar" to Petitioner's hair, but also that it was *not* microscopically similar to Martin Chmiel's hair, and that he could exclude Martin as the source. However, subsequent DNA testing of hairs found at the crime scene demonstrate the unreliability of Mr. Surma's conclusions. As discussed above, subsequent mitochondrial DNA testing revealed that the two hairs could have come from Martin, Petitioner, any of their maternal relatives, and an unknown number of other people. Trial Tr., Aug. 29, 2002, at 172–175. Furthermore, Mr. Surma testified that the four additional hairs were "microscopically similar" to Martin, Petitioner, and Victor Lunario, but subsequent DNA testing of these four hairs found that Angelina Lunario and her maternal relatives could not be excluded, but that both Petitioner and Martin were excluded. *Id.* at 167–68.

The hair microscopy evidence and related testimony was the cornerstone of the Commonwealth's case, and the only physical evidence presented that tied Petitioner to the scene

of the crime. It was also the only evidence that implicated the Petitioner and not his brother Martin. While the Commonwealth presented a single perpetrator theory, Petitioner's defense at trial was that the remainder of the circumstantial evidence presented at trial equally implicated his brother Martin, creating reasonable doubt. The Commonwealth put considerable weight on the hair microscopy evidence and the jury is likely to have put unwarranted weight on the hair microscopy evidence because of the persuasive nature of forensic evidence. *Id.* This is precisely the kind of evidence that research shows jurors cannot independently evaluate and which, in cases involving invalid forensic evidence, is likely to lead to wrongful convictions.

CONCLUSION

Microscopic hair comparison testimony is inherently unreliable, not scientific, and, therefore, altogether inadmissible as expert forensic evidence, regardless of how the expert might limit his testimony. Given the state's reliance on such evidence at Petitioner's trial, Petitioner's motion for a new trial should be granted.

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Respectfully submitted,

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IN THE SUPREME COURT OF PENNSYLVANIA

NO. CAP 780

DAVID CHMIEL,

Petitioner,

v.

COMMONWEALTH OF PENNSYLVANIA,

Respondent.

CERTIFICATE OF COMPLIANCE

Amicus – the Innocence Project – certifies that the amicus brief it filed on December 6, 2019 in support of Petitioner David Chmiel complies with the Pennsylvania Rules of Appellate Procedure because it contains less than 7,000 words – or 6,617 words to be exact.

Respectfully submitted this the 11th day of December, 2019.

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